

# Energy Efficiency:

Getting Rich  
while Getting out of the Greenhouse

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# Are Frogs Smarter than Humans?

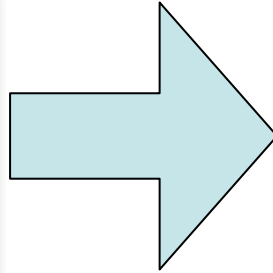






# Solutions

## Mitigate



## Adapt



## Suffer



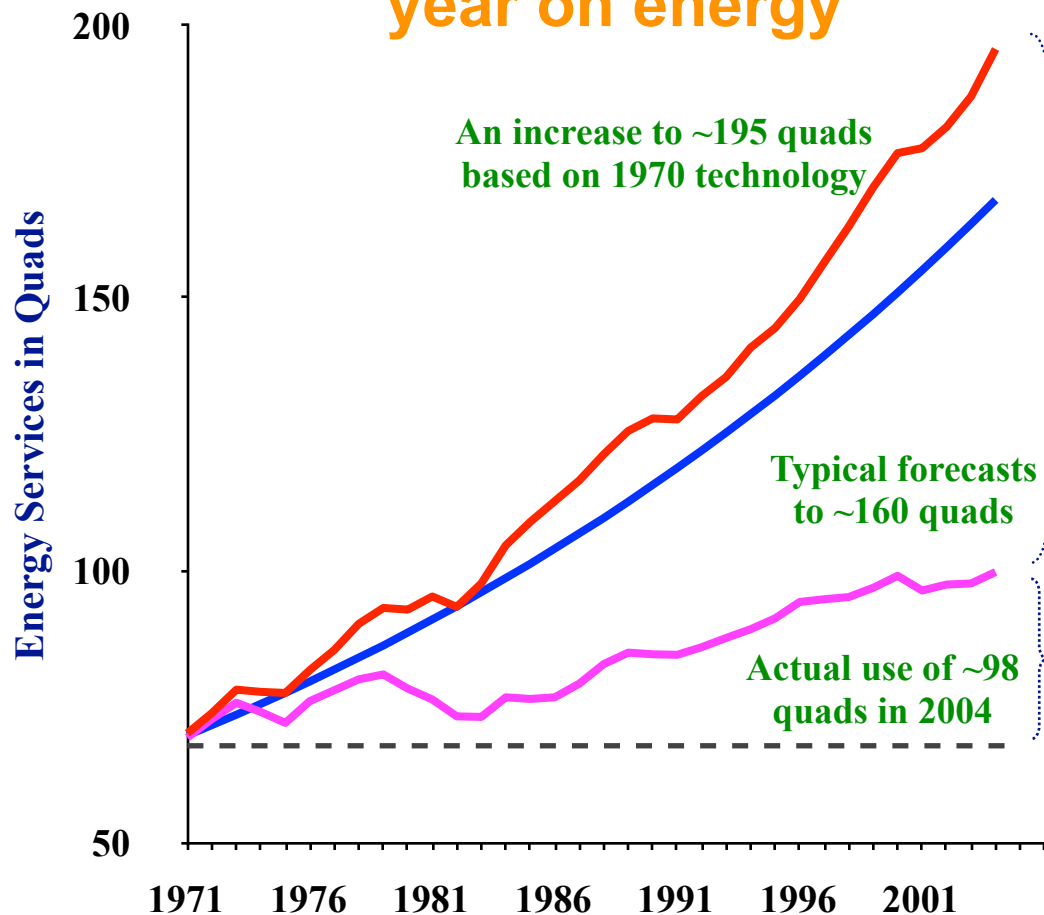
- Hack the Earth
- Carbon trading
- Carbon sequestration
- Nuclear power
- Fuel-switching
- Conservation
- Efficiency
  - largest potential
  - cheapest
  - safest
  - domestic resource
  - fastest to deploy

Everything can always be  
done better than it is.

- Henry Ford

# Without New Efficiency Technology,\*\* U.S. Energy Use Would Be 3-times 1970 Levels

**We spend > \$1 trillion/  
year on energy**



## Contrast 3 Energy Patterns

- ✓ Using 1970 Technology
- ✓ Standard 1970s Forecast
- ✓ Actual energy use since 1970

*Since 1970, energy efficiency has met 75% of new energy service demands in the U.S., ...*

- 8.9 times total domestic oil production
- 3.7 times total oil imports

*...while new energy supplies have perhaps contributed only 25% of new energy service demands.*

**\*\* Where “energy efficiency” is broadly defined as the difference between the 1970 and 2004 energy intensities.**

Source: Skip Laitner, ACEEE

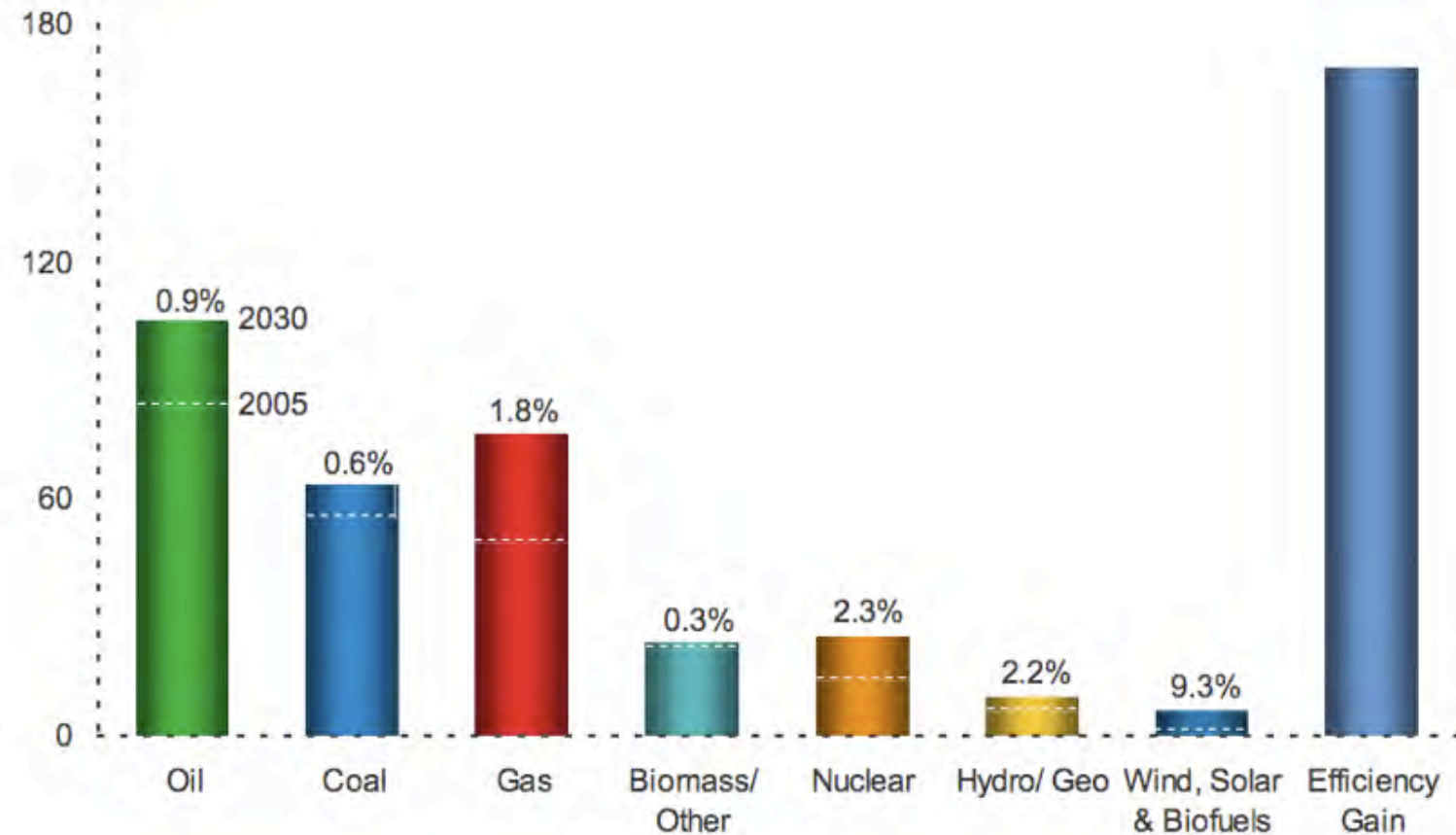
## growing global energy demand



### growing global energy demand

by fuel

MBDOE

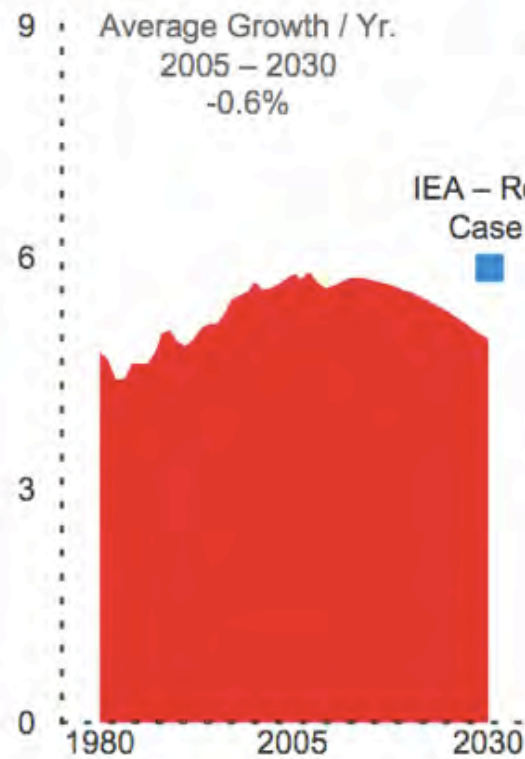


## CO<sub>2</sub> outlook by region



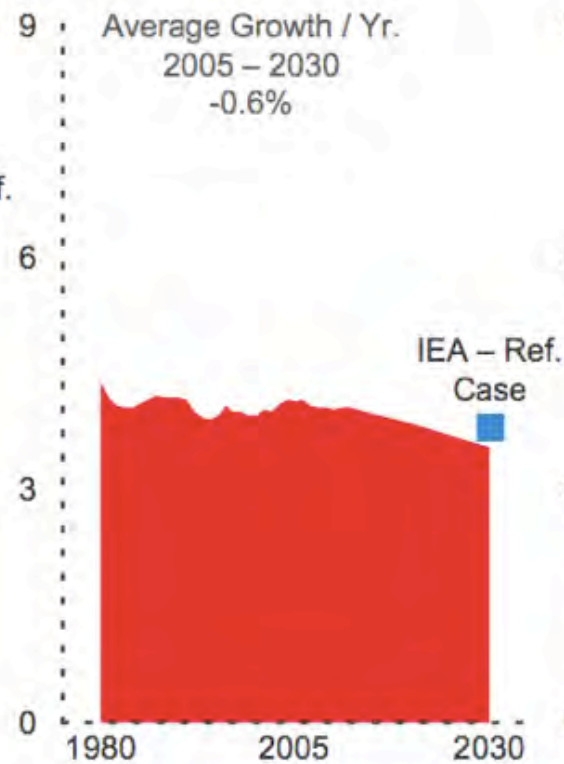
### United States

billion tonnes



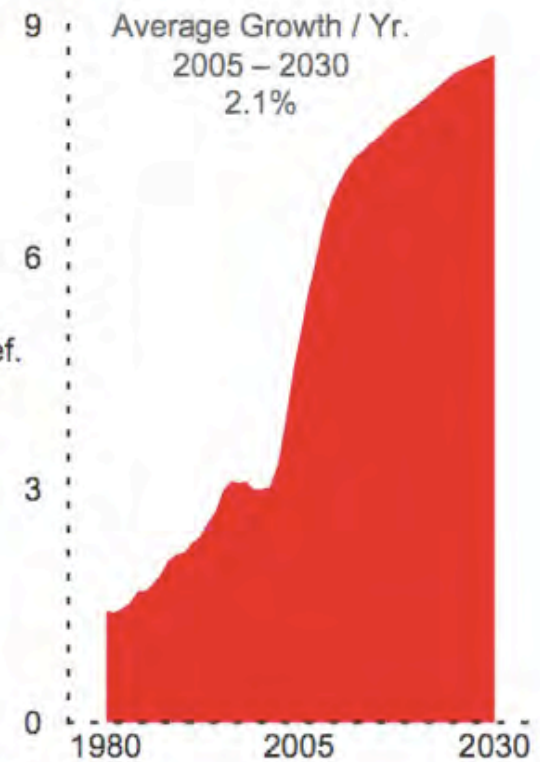
### European Union

billion tonnes



### China

billion tonnes



■  
IEA – Ref.  
Case



# Clean Tech: Our “Sputnik Moment”

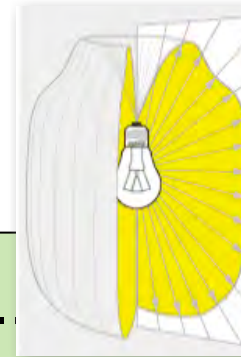


U.S. Secretary of Energy  
November 29, 2010  
National Press Club

# Energy Services



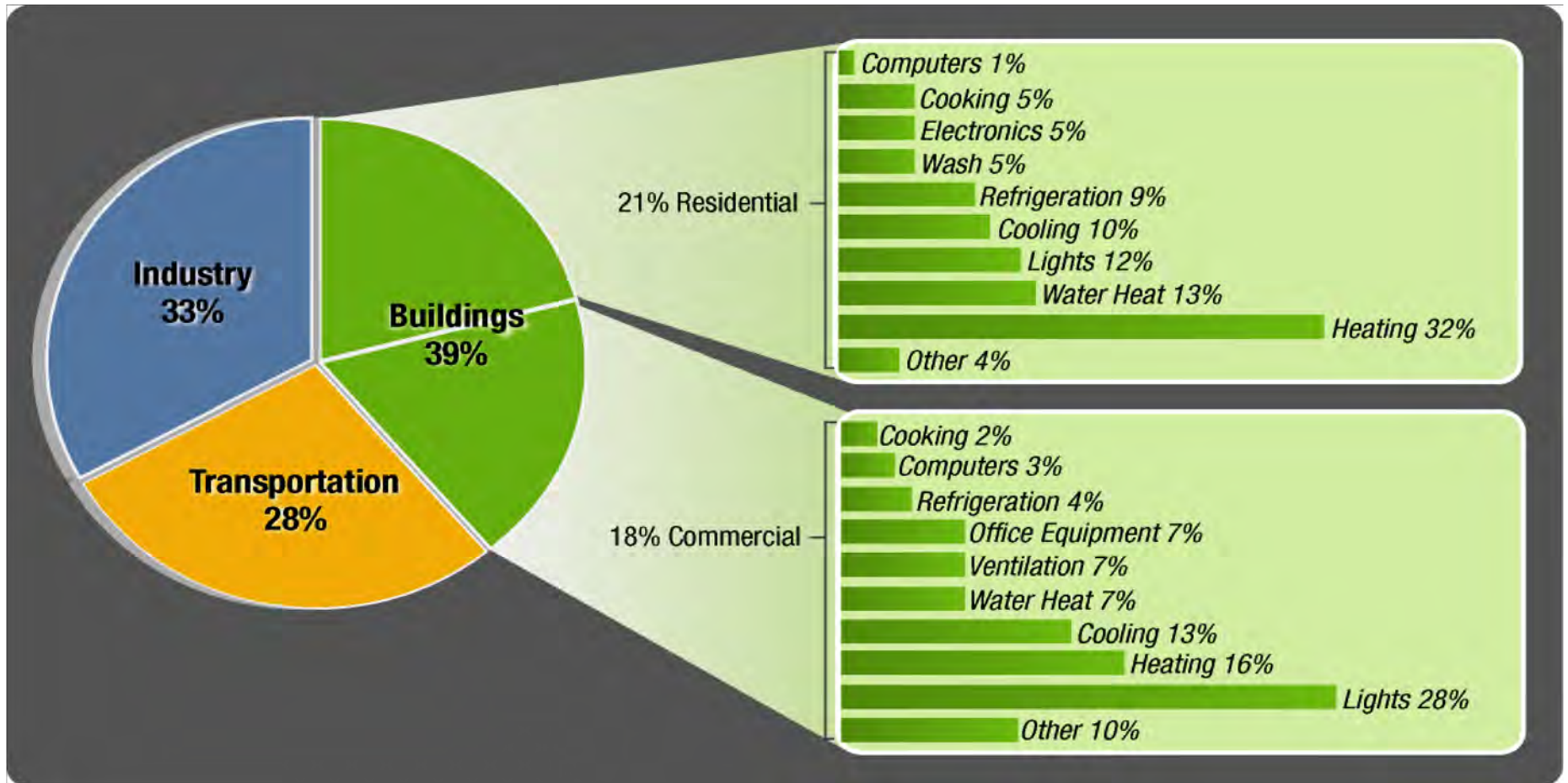
Energy .....



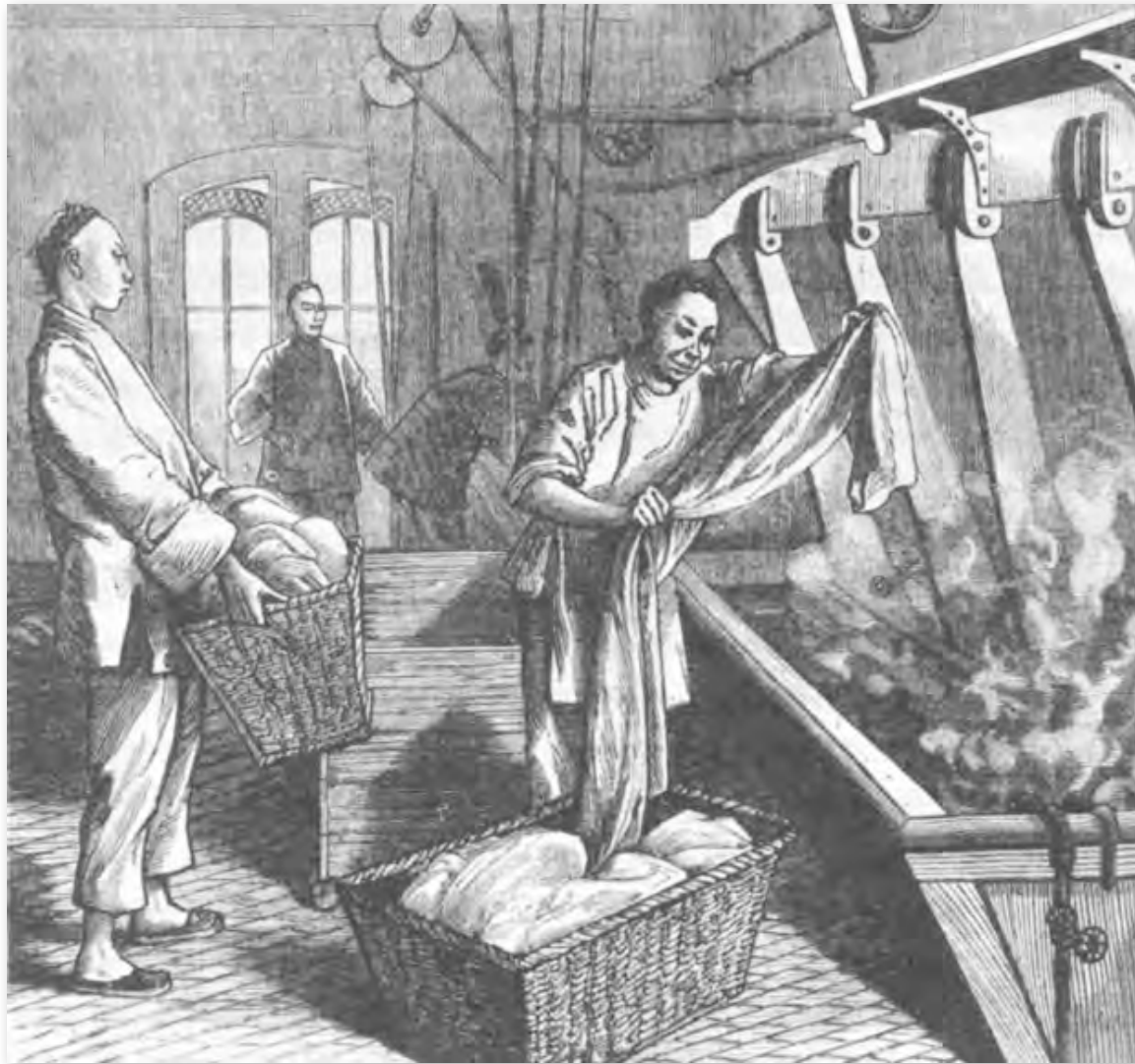
.....Service



# An “End-Use” Perspective

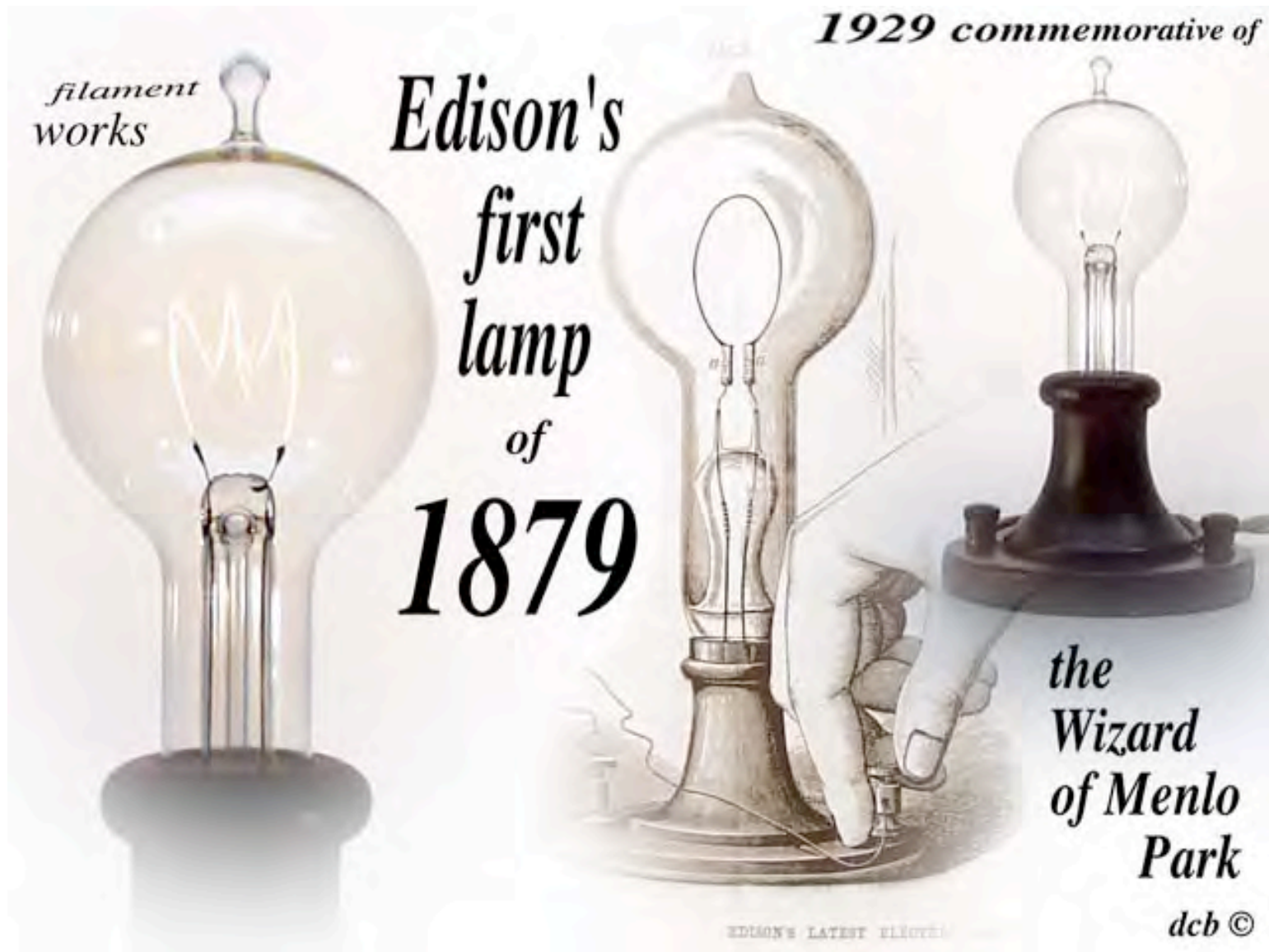


Today's washer-dryers 100x more efficient than coal-fired laundries





# Efficiency is Competitive





# Energy Services

4 ADVERTISEMENTS.

---

J. M. LIVINGSTON, Pres., S. F. C. O. G. MILLER, Sec. and Treas., S. F.  
T. D. PETCH, Supt., Eureka

\*\*\*

## THE EUREKA LIGHTING COMPANY

—DEALERS IN—

Electric Light and Gas Supplies  
Lights Installed on Short Notice

—♦—

COKE, COAL AND COAL TAR FOR SALE

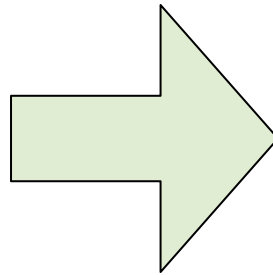
Any information given by applying to  
**T. D. PETCH, Supt., 100 C Street, Eureka**

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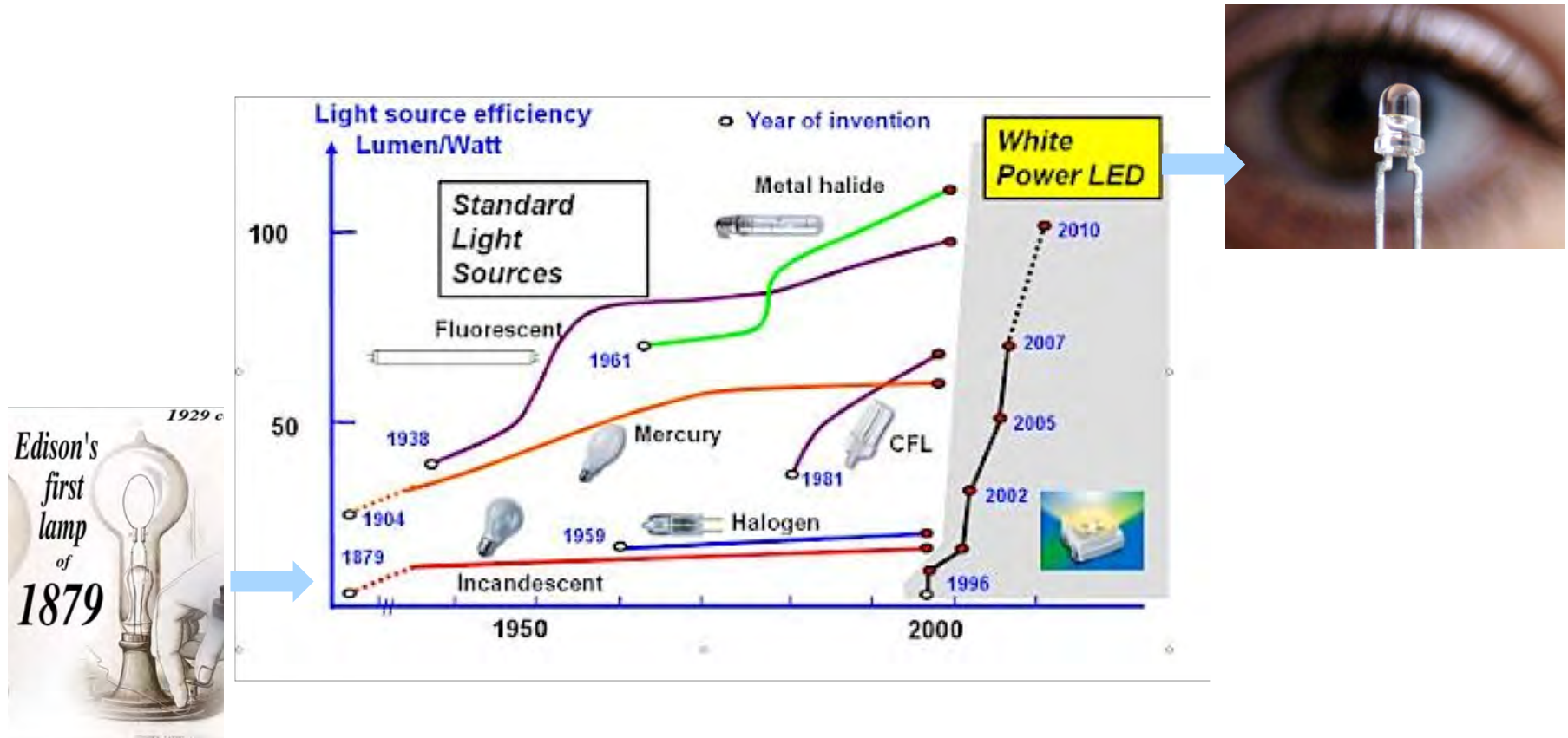


President Carter's (in)famous "Fireside Chat" on Energy - February 2, 1977

# The Kakelung: Product of an Early Energy Crisis in Sweden



# White Light-emitting Diodes (“LEDs”)



A century of electric lighting technology, with the “disruptive” entry of solid-state white lighting (“LED”) in the past decade.

# Autonomous Energy Efficiency





# Low-Hanging Fruit



Outdoor lights on during day at school in Mexico....

# Low-Hanging Fruit



Outdoor lights on during day at an undisclosed location in Fort Bragg

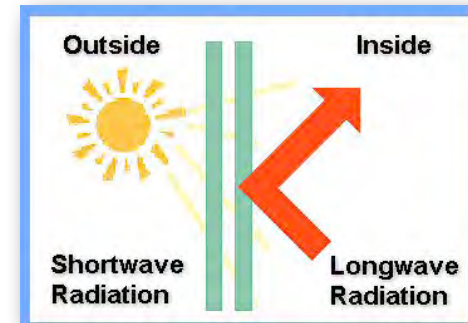
# Potent Analogies



Rate of heat loss from US windows = rate of energy  
flowing through Alaska Pipeline



# Potent Analogies



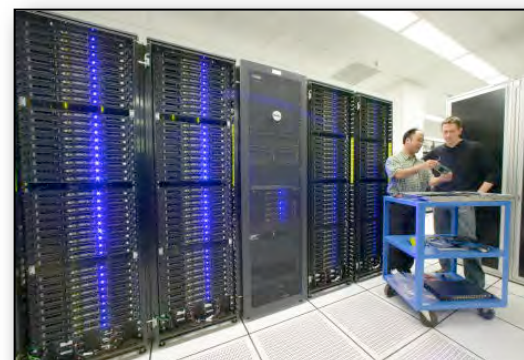
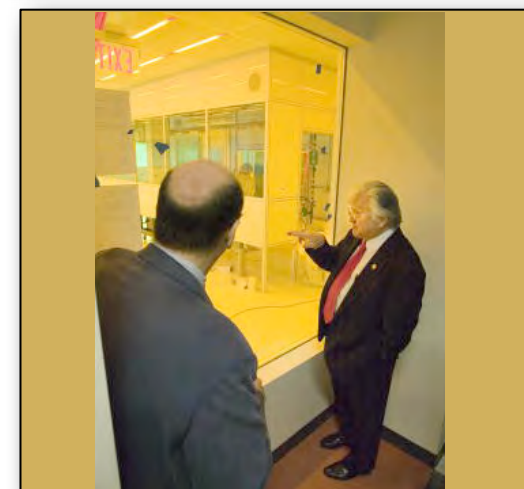
Offshore Oil Rig:  
\$300 million

=



Low-E Window Coating Plant:  
\$6 million

# The Molecular Foundry - High-tech can be green







Thanks to downsizing of HVAC system, this building cost no more to build than a standard non-green version

## LBNL's Molecular Foundry [Greenhouse Gas Emissions]

Pounds  
CO<sub>2</sub>/year

3,000,000

2,500,000

2,000,000

1,500,000

1,000,000

500,000

And this version was cheaper to build!

Kyoto Svgs

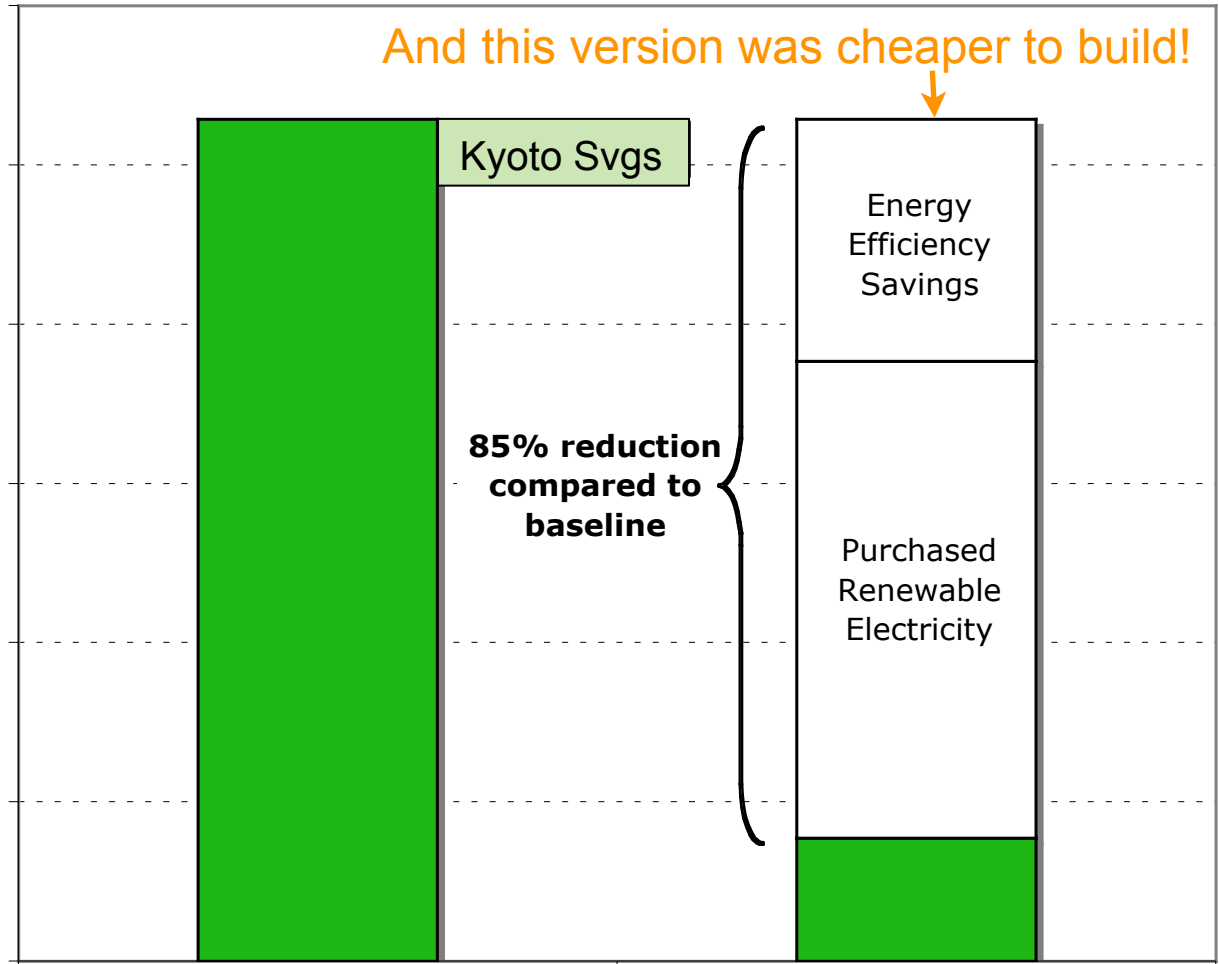
85% reduction  
compared to  
baseline

Energy  
Efficiency  
Savings

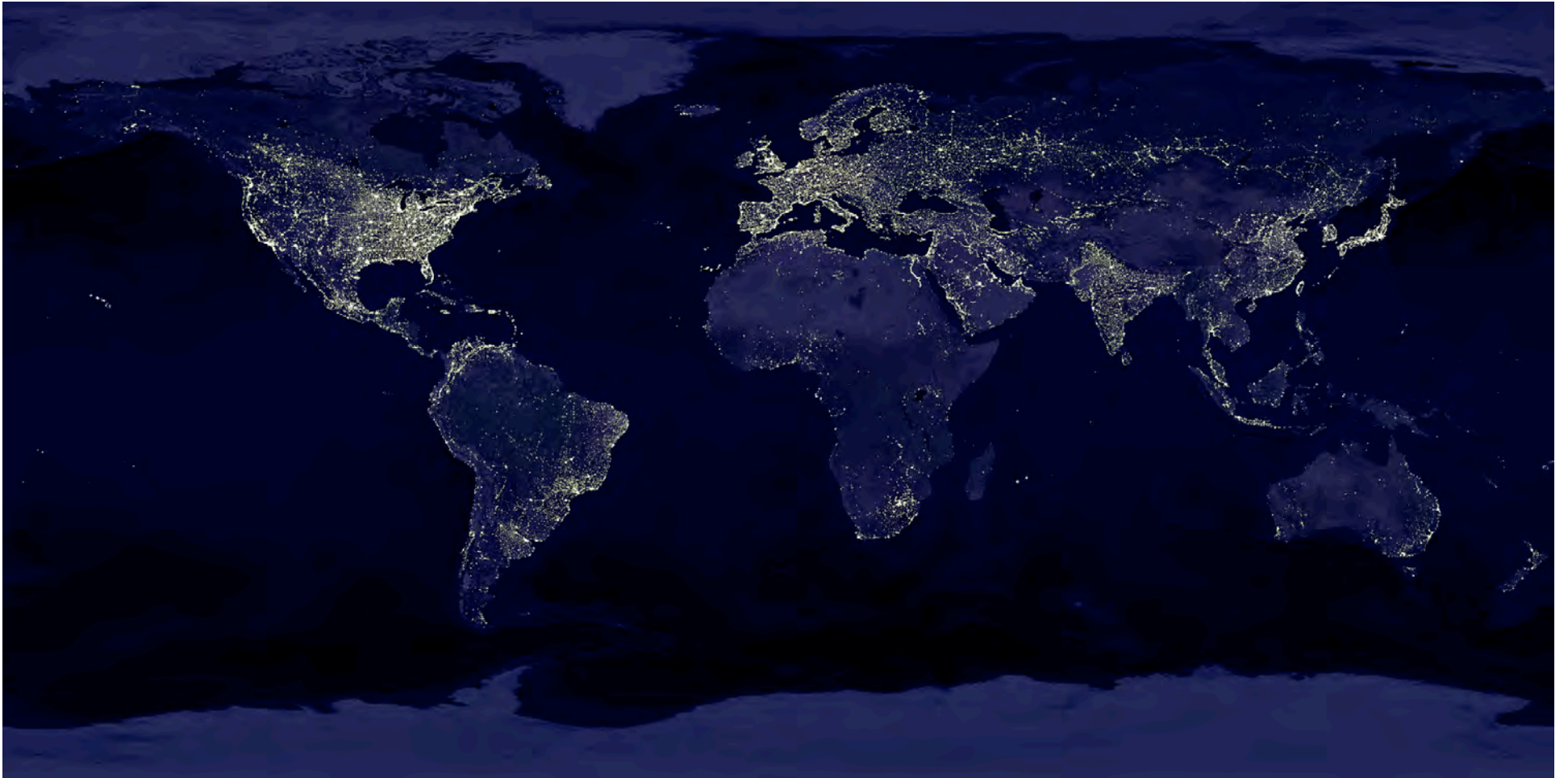
Purchased  
Renewable  
Electricity

Typical Construction

As-built



# The Specter of Fuel-Based Lighting





**India:** street vendor (Varanassi)



**“We will make electricity so cheap  
that only the rich will burn candles”**

- Thomas Edison



In the developing world, 14% of urban households and 49% of rural households have no electricity ... (2000 data)





## Baseline technology & economics



Kenya (Kibera)



### Tin lantern

- \$0.20 to buy ...
- \$30/year to use







## Studying by streetlight



Guinea



## LEDs

- Efficient
- Long life
- Low voltage
- Directional
- Portable
- Rugged
- No mercury
- Common batteries
- 10-100x the service level of flame light





## Demonstrating the technology to users

Flame: 0.1 lumens/watt • 1-10 lux



Tanzania

LED: 50 lumens/watt • 100-500 lux







## Focus Groups



Kenya (Kisumu)





## Teachers



Kenya (Sauri)



## Night markets



Kenya (Kisumu)





## Night markets



Kenya (Kisumu)



## Night markets

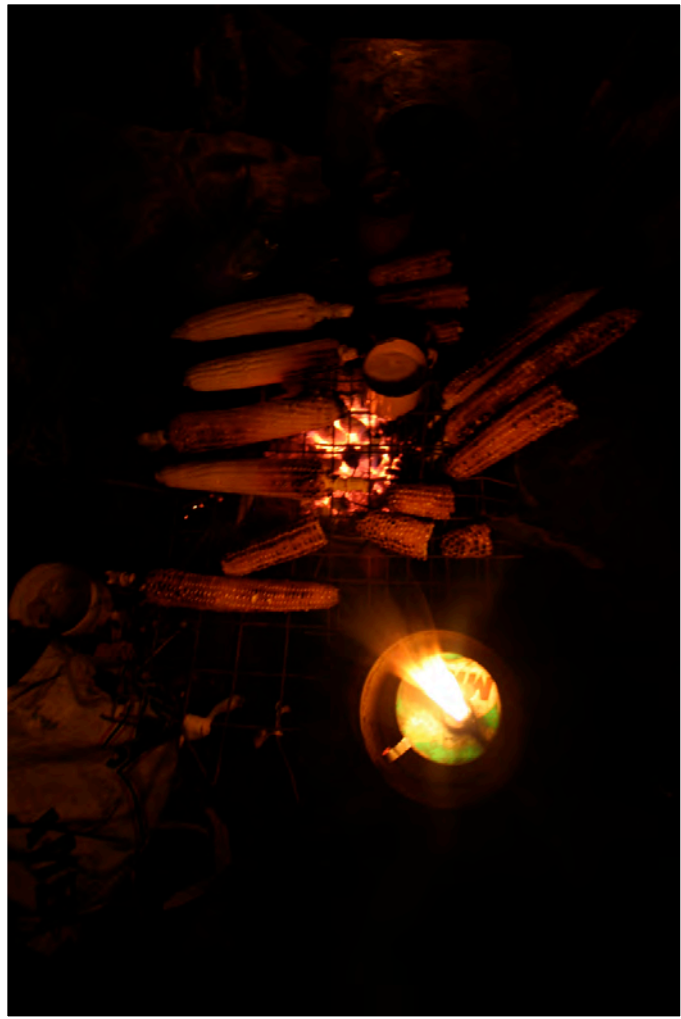


Kenya (Kisumu)

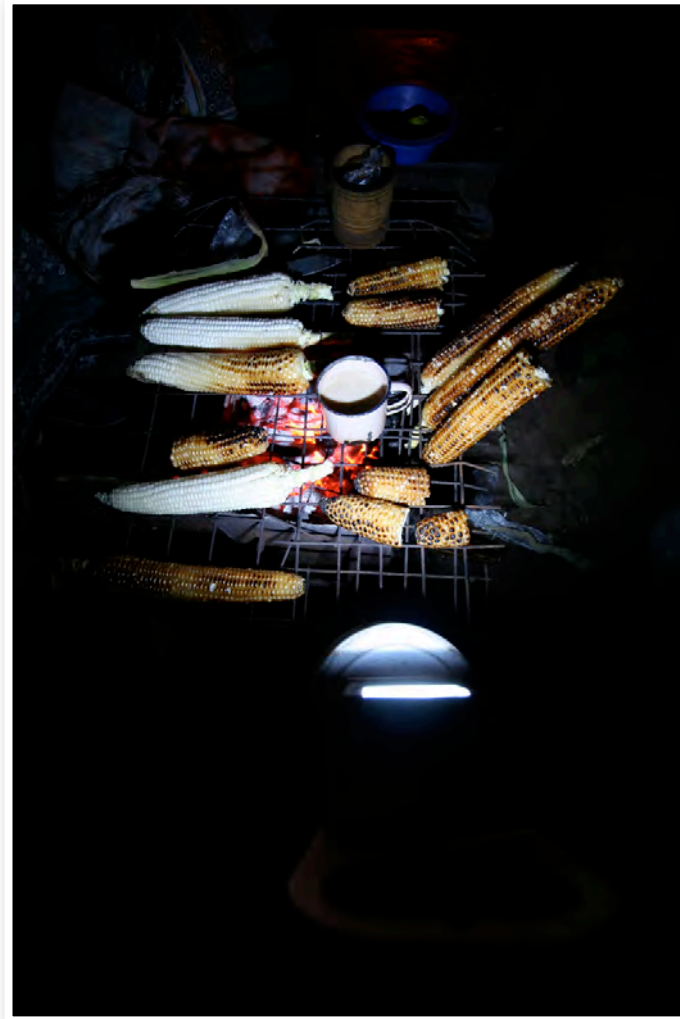




## Night markets



Kenya (Kisumu)





## Chicken production



This farmer produces 9000 birds in 3 houses every 5 weeks -- Rift Valley (Kenya)

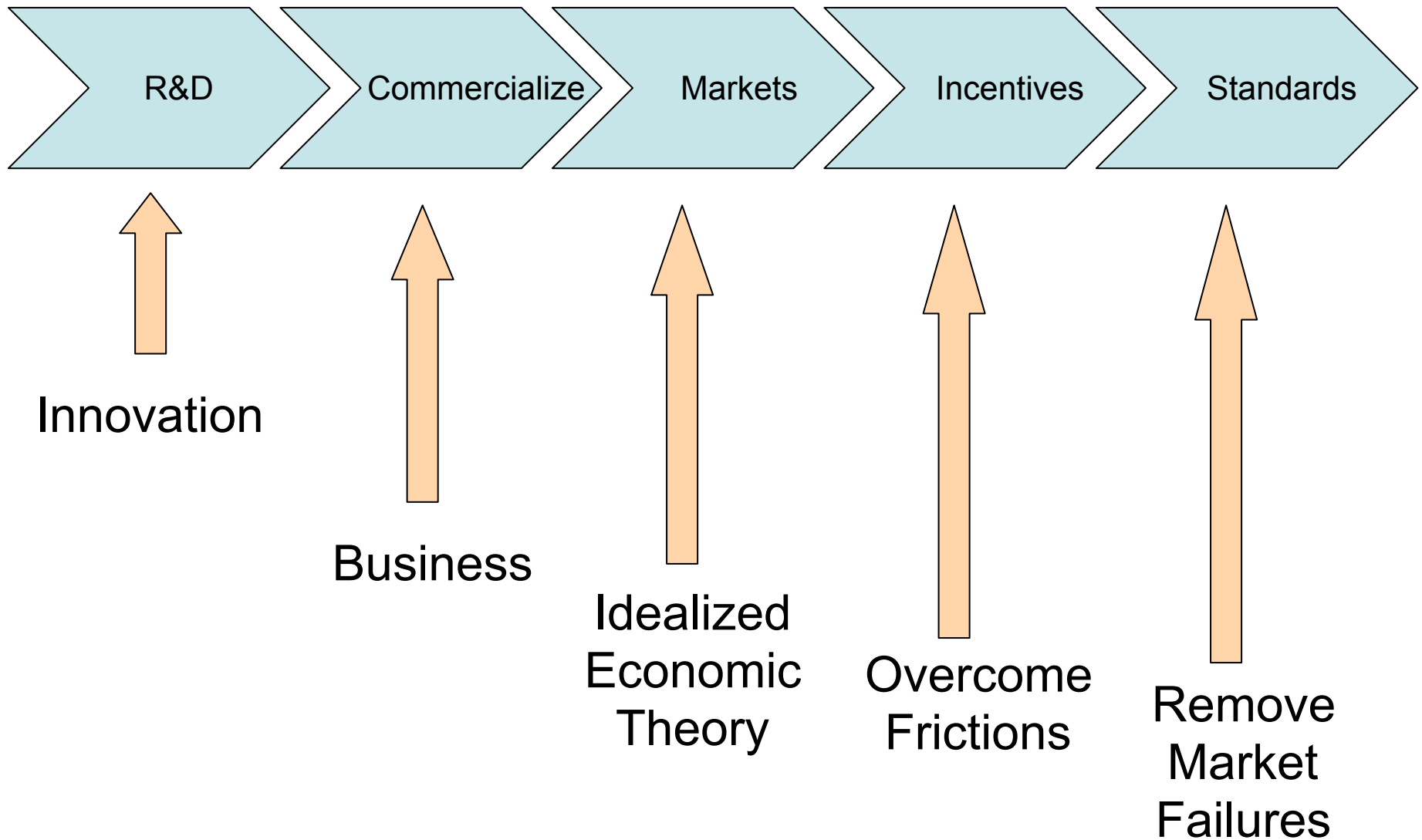




## Lighting Africa Business Conference (2010)



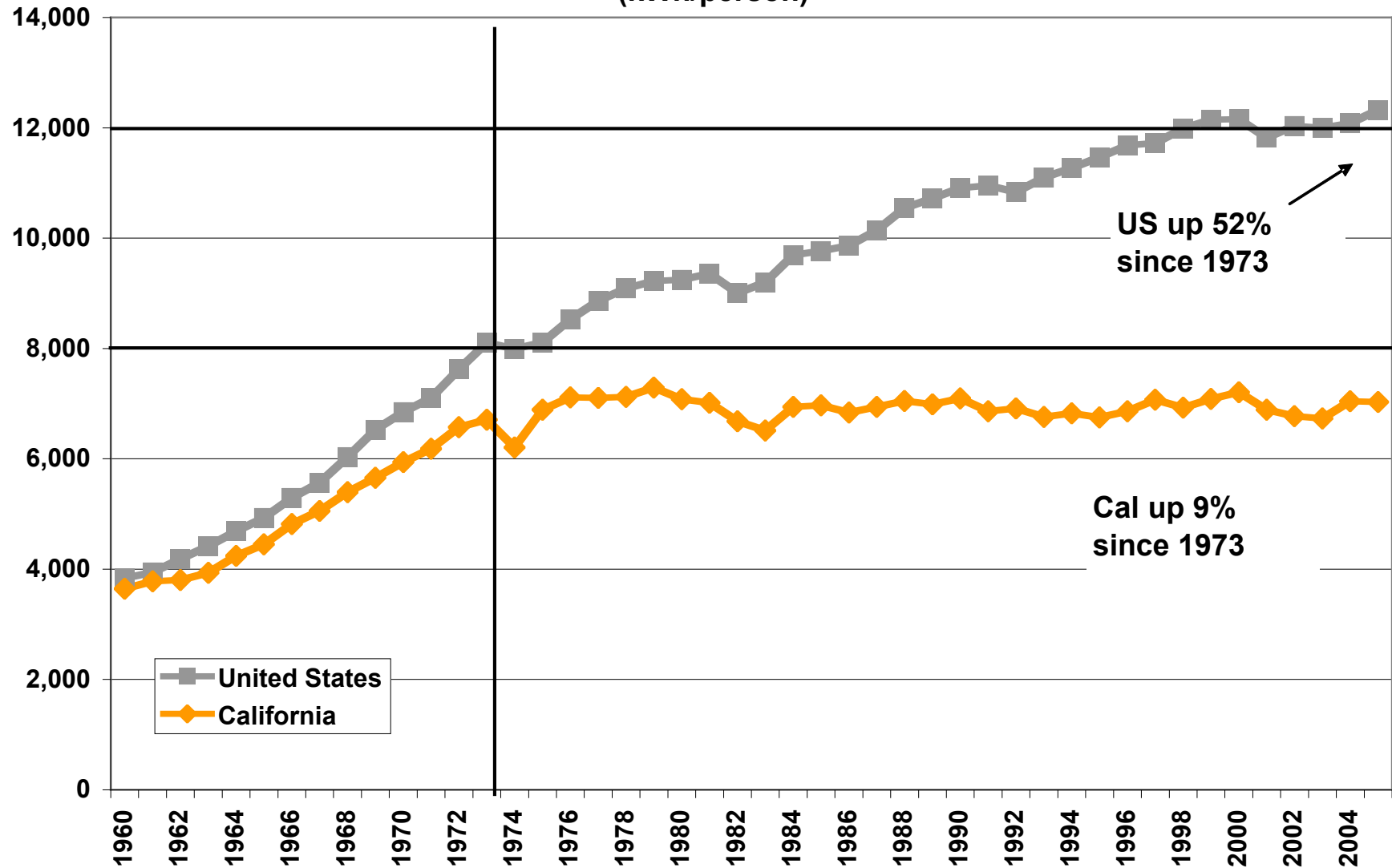
# Making it Happen



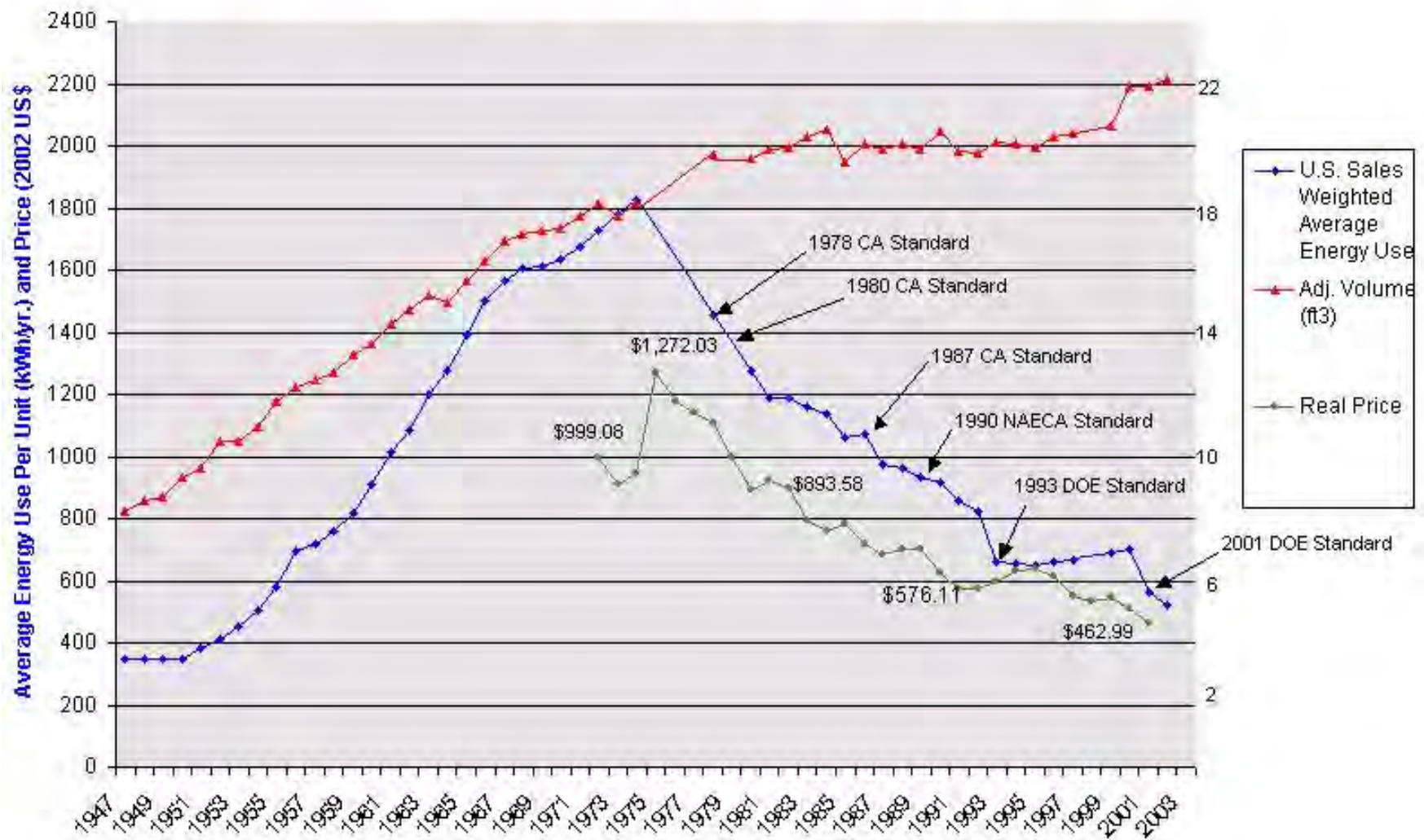


# The California Story

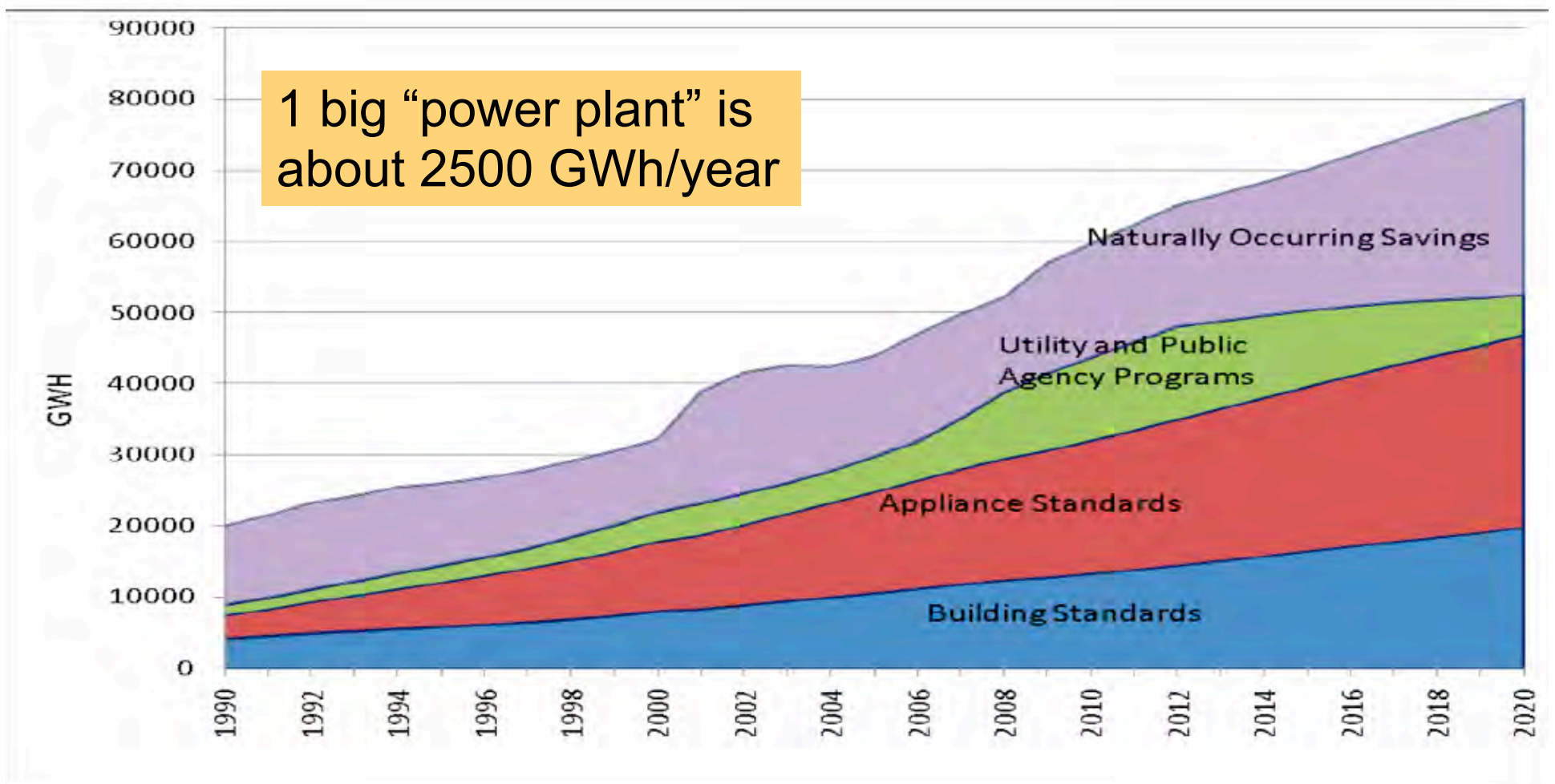
Per Capita Electricity Sales (not including self-generation)  
(kWh/person)



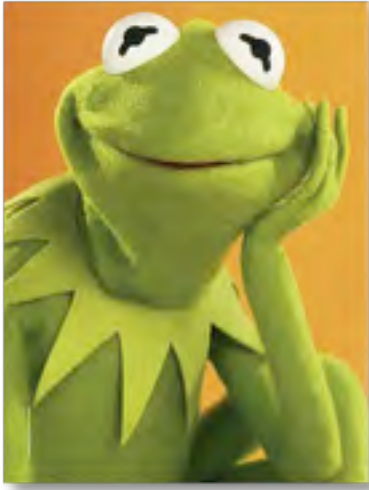
## U.S. Refrigerator Energy Use v. Time with Real Price



# Savings from California Energy Efficiency Policies



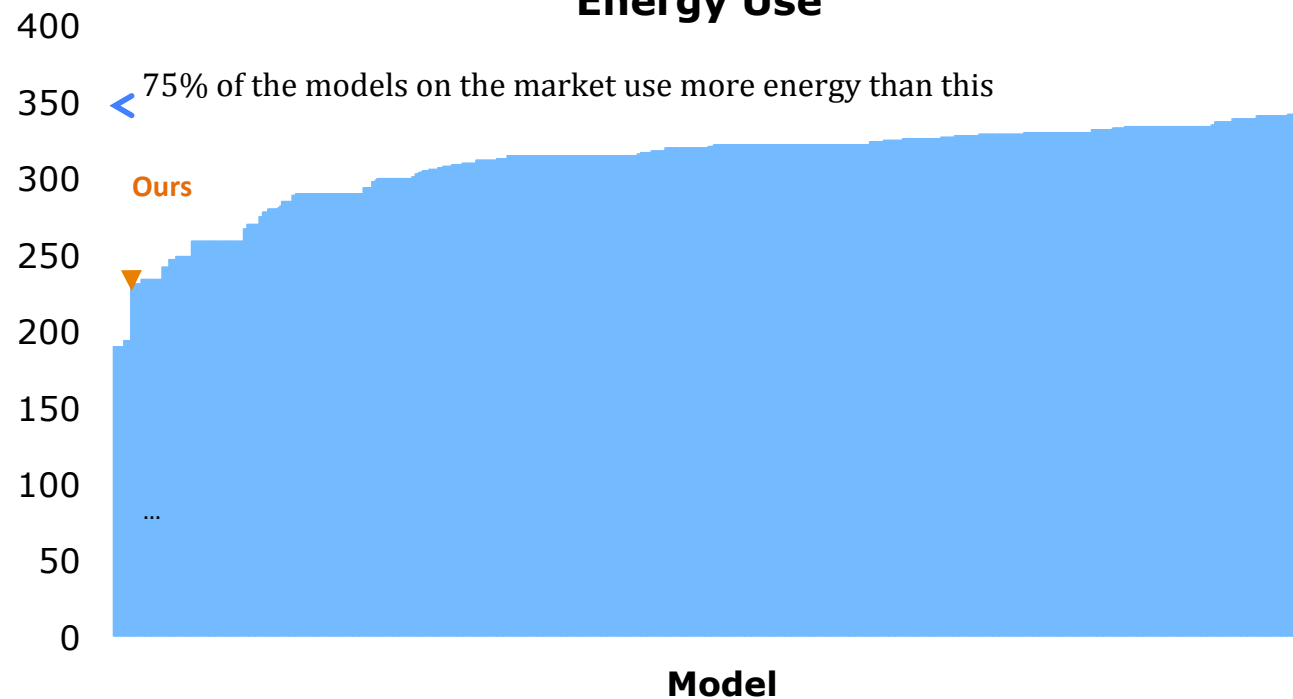
Source: California Energy Commission (2009)



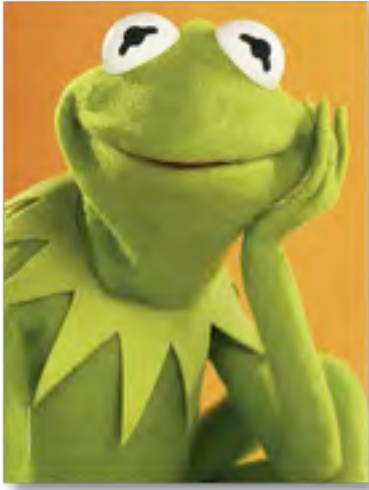
# Kermit was Right

Energy Use  
(kWh/year)

## Energy Star Dishwashers Models Sorted by Energy Use





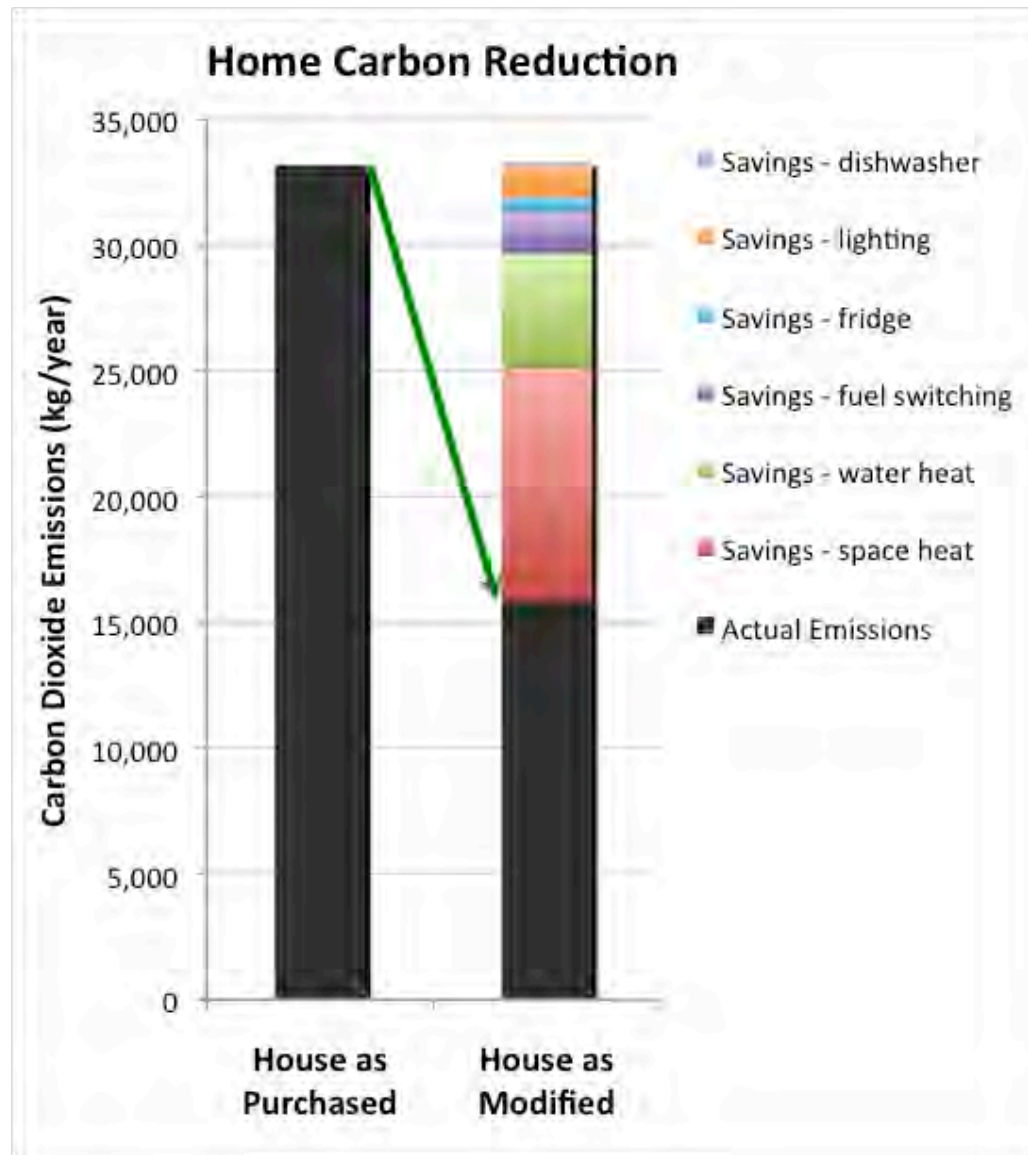


# Kermit was Right





# Kermit was Right



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**GO**

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### Case Studies

"Home Energy Saver helped me save thousands of dollars per year. It is one government service that makes paying taxes worthwhile."

— Nick Wilder  
Wheat Ridge, Colorado

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### Energy NewsWire

- [Are You Keeping Up with the Joneses?](#)
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- [LED Holiday Lights: Festive, Safe, and Efficient!](#)

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- [Obama at Home Depot](#)
- [HES featured by Suze Orman in Oprah Magazine](#)





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# NEW: Home Energy Score



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**HOME ENERGY SCORE**

Customer: 100 Park Lane, Pittsburgh, PA 15201

Score: 8

Cost Savings: \$520

Energy Use: 1,200 kWh/year

Score Range: 1 to 10

Score 8: Good

Score 9: Very Good

Score 10: Excellent

The DOE's ENERGY STAR program is a national symbol of energy efficiency.


U.S. DEPARTMENT OF ENERGY

**The Department of Energy's Home Energy Scoring Tool allows qualified assessors to:**

- Generate clear, credible home energy assessments at a reasonable cost;
- Recommend customized upgrades and other cost saving tips; and,
- Help consumers compare the energy use of different homes.


The Home Energy Scoring Tool is quick and easy to use. Qualified assessors can gather the information needed to assess a home in one short site visit. This low-cost, high value assessment can be provided as a stand-alone service or as an add-on to a home inspection or comprehensive energy audit.


For more information on how to become a qualified assessor or receive a home energy score, visit [www.homeenergyscore.gov](http://www.homeenergyscore.gov).



**Video: What is Home Energy Score?**

Watch this 3 minute video to learn about the DOE's new Home Energy Score Program. Home Energy Score offers householders and home buyers an easy and economical way to get a credible, home energy audit, with customized advice on how to save energy in your home and money on your utility bills.

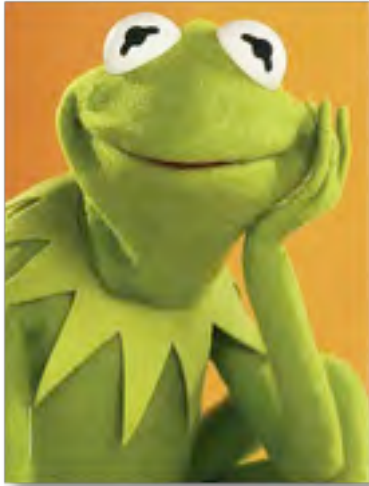
 Lawrence Berkeley National Laboratory

 U.S. DEPARTMENT OF ENERGY

The Home Energy Scoring Tool was developed by Lawrence Berkeley National Laboratory in collaboration with the U.S. Department of Energy. The modeling engine can be licensed as a web service API.


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